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Throwing Speed of Kosovo Handball According to Playing Position

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Abstract

The goal of this paper was to assess the throwing speed of the ball without jumping, and three steep jumps by playing position (backcourt, wing, pivot, and goalkeeper) In this research, we measured 93 players from Kosovo's elite league (22±4.70 years old; training experience 8.30±4.29 years; body height 183±7.83 cm; weight 84±13.74 kg); measurements were made with a radar speed gun. The results obtained were analysed through descriptive statistics for morphologic parameters, but throwing speed was analysed using ANOVA and the Kruskall-Wallis post hoc test. The overall average throwing speed without jumping was 85.67±8.13 km/h, while throwing seed with three-step jump was 84.20±8.68 km/h. measured by the radar gun. Without jumping back-court players have been distinguished compared to wingers and goalkeepers while there were no significant differences with pivots. Also, almost the same results have been achieved in the throwing speed of jump shot. As differences in throwing speed have been established according to the playing positions, we think the exercises for each position should also be differentiated.

Keywords: *handball player, throwing speed, play position*

Introduction

Handball consists of intensive play, swift (sprints), jumps, declines, and "battles" within official rules of the game, and, where permitted, catching, drawing, pushing and holding opponent players (Havolli, Bahtiri, Begu, Ibrani, & Makolli, 2018). The physical demands of handball include running with and without changes of direction at speeds ranging from walking to rapid sprints, vertical jumping, various types of throwing, and direct physical contact, plus an ability to make multiple sprints at high speed. Several qualitative and quantitative studies of top-level male handball players have demonstrated that key characteristics of the successful professional include endurance capacity, sprint performance, jumping ability, and high throwing speed (Hermassi, Chelly, Tabaka, Shephard, & Chamari, 2011; Manchado, García-Ruiz, Cortell-Tormo, & Martínez, 2017).

Handball players are usually classified according to their specific playing positions when attacking: goalkeepers, located in the goal, the first line made up of backs and centre backs, and the second line made up of the pivots and wings (Sibila, Mohoric, & Pori, 2010).

In handball, as in other team sports, shooting a ball at the goal is the culmination of an offensive phase. The morphological characteristics of the body and motor abilities certainly have great influence on outstanding performance in handball (Sibila et al., 2010). Handball is characterized by running, jumping, blocking, catching, and throwing; even though most of the work is done with the legs, play is realized by the hands. Success or failure depends on whether a team attains its ultimate aim: scoring a goal. Throwing efficiency is the key to winning or losing matches and has been the subject of various studies (García et al., 2011). Throwing efficiency largely depends on the accuracy and speed of a throw (Gorostiaga, Granados, Ibanez, & Izquierdo, 2005). Also in this type of movement, the joint and body segments must be synchronized to achieve maximum throwing speeds (Werner, Fleisig,

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Dillman, & Andrews, 1993). There are several arguments for the efficacy of this organization, which include mechanical (derived from Newton's Laws) and muscular aspect (a result of muscle pre-stretching or of optimal muscular coordination). According to various studies (Joris, Edwards, Van Ingen Schenau, & Kemper, 1985), the factors that determine throwing velocity are technique, coordination, and maximum explosive power of the muscles in the upper and lower body, which indicates the importance of developing training methods that improve both accuracy and throwing velocity. The correlation between the throwing speed of the ball in the goal and some motor skills has been proven in the work of Alves and Marques (2013).

Another factor that makes the speed shot important is that recently goalkeepers have improved their performance; researchers emphasize that the handball goalkeeper is worth 50% of the team (Çitaku, 1999), and the low speed of the ball means the goalkeeper can accomplish more saves (Rivilla-Garcia, Grande, Sampedro, & van Den Tillaar, 2011).

According to the literature, handball in Kosovo began to be played in the early 1950's, with modest results. The best result for Kosovar handball players recently is the qualification of the Kosovo U-21 Representation in the World Championship, which was held in Spain in 2019. Also, these players have been part of this research. Earlier in Kosovo, some partial research studies were carried out, with a specific and mainly morphological sample. Our sample is comprehensive (includes players playing in Kosovo's elite league). Many different handball researchers have noted that morphological and motor characteristics are essential in the performance of handball players during the game; in this paper, we wanted to treat the throwing speed to the goal as one of the most important parameters in the handball game.

The purpose of this paper was to evaluate some morphological parameters and to assess the throwing speed of the ball in the goal with and without bouncing, according to the positions of the players on the field.

Methods

To perform this research, all samples were initially conducted at a medical control centre of sports medicine in Pristina; all the players were confirmed to be sufficiently healthy to train for handball and, in accordance with the Helsinki Declaration, all participants were informed about the purpose and procedures of testing and experimental treatment.

Participants

The sample of subjects consists of 93 handball players of Kosovo's Elite League (22±4.70 years old; training experience 8.30±4.29 years; body height 183±7.83 cm; weight 84±13.74 kg). The sample was classified into four groups according to the specific playing position: backs (B), pivots (P), wings (W) and goalkeepers (G).

Procedures

All measurements were performed on parquet flooring in College Universi in Prishtina at the same time and day, with a specialized framework and directly with the participation of the author of the study. At the beginning of the study, all participants underwent morphological characteristics measurements (body height and body weight) were obtained according to the international guidelines.

Body height was measured while standing barefoot using a SECA stadiometer Selectronic scale (Seca Instruments Ltd., Hamburg, Germany) to the nearest 0.5 cm, while weight is measured with a Biospace Inbody 720 bioimpedance device (Inbody Co., Leicester, United Kingdom).

Before the throwing velocity assessment, the subjects performed a 15-minute warm-up focused on overhead throwing. Handball throwing performance was evaluated by measuring the speed of a standing shot and the speed of a three step jump shot using a Bushnell Radar device (Overland Park, USA). Each participant performed one familiarization shot and two test shots from each position with a one minute of rest between each shot.

Statistical analysis

The difference between the throwing speed according to the playing positions was calculated using one-way analysis of variance (ANOVA) for normally distributed variables and homogeneous variances; otherwise, the Kruskall-Wallis test was applied. All statistical analyses were performed using IBM SPSS version 21 (SPSS Inc., Chicago, Illinois, USA), and the level of significance was set at $p<0.05$.

Results

The results obtained were analysed through descriptive parameters for morphologic and age parameters in Table 1.

Table 1. Descriptive statistics morphologic parameter (N=93)

	Mean±St.Dev.	Min	Max
Age	22.13±4.70	17	39
Training duration (years)	8.30±4.29	2	25
Height	183.97±7.83	161.0	204.5
Weight	84.10±13.74	59.4	118.5

In Table 2, the differences according to the game positions of some morphological parameters, age and experience in handball are presented. There were statistically significant differences in the playing positions in measured anthropometric variables and ($p<0.01$; Table 1). The wings were significantly smaller compared to backcourt players ($p=0.000$), pivots ($p=0.035$) and goalkeepers ($p=0.018$). Similar significant differences were obtained in weight (pivots vs wing, $p=0.000$; wings vs backcourt players, $p=0.000$; wings vs goalkeeper, $p=0.000$) whereas there are no significant differences in terms of age and experience of handball players according to game positions.

Table 3 presents throwing speed as analysed using ANOVA and Kruskall-Wallis tests. The results obtained from the throwing speed of the ball measurement with the radar gun. According to the positions of the players regarding the speed of the standing shot, the best results are made by backcourt players with an average of 88.94 km/h, while the poorest re-

Table 2. Differences according to game positions of morphological parameters according to ANOVA and Kruskal-Wallis test

	backcourt (N=35)	wing (N=26)	pivot (N=15)	goalkeeper (N=17)	p
	Mean ± Standard Deviation				
Age	22.80±5.24	21.46±4.47	22.13±3.83	22.18±4.68	0.163
Training duration (yrs)	9.34±4.65	7.65±4.31	7.87±3.65	7.53±4.00	0.253
Height (cm)	187.16±7.761	178.47±6.70	184.81±6.931	185.08±6.281	0.000
Weight (kg)	86.75±10.931,2	74.52±8.70	101.73±11.131,2	77.75±10.31	0.000

Legend: 1 - significantly different from wing; 2 - significantly different from goalkeeper

sults were with goalkeepers at 78.47 km/h. Statistically significant differences were obtained between wings and goalkeepers (p=0.003), pivots and goalkeepers (p=0.000), backcourts and goalkeepers (p=0.000), backcourts and wings (p=0.027).

Table 3. Differences according to the positions of the shooting speed game through ANOVA and Kruskal-Wallis test/post-hoc

		M±Std.Dev.	ANOVA	Kruskal-Wallis test	p
Speed of standing shot	backcourts	88.94±7.25	0.000	wings-goalkeepers	0.003
	wings	84.35±8.87		pivots-goalkeepers	0.000
	pivots	88.47±5.36		backcourts-goalkeepers	0.000
	goalkeepers	78.47±5.60		backcourts-wings	0.027
	Total	85.67±8.13			
Speed of jump shot	backcourts	87.69±7.17	0.000	wings-goalkeepers	0.007
	wings	82.81±8.82		pivots-goalkeepers	0.000
	pivots	87.13±8.93		backcourts-goalkeepers	0.000
	goalkeepers	76.59±5.82		backcourts-goalkeepers	0.028
	Total	84.20±8.68			

Almost the same results have been achieved in throwing speed of jump shot: the wings and goalkeepers have significant differences of p=0.007, the pivots and goalkeepers of p=0.000, the backcourts and goalkeepers of p=0.000, and the backcourts with the wings at the significance level of p=0.028.

The same results in which the goalkeepers had the poorest shooting speed is also confirmed by Rivilla-Garcia et al. (2011).

Discussion

Most authors agree that one of the main morphological features in handball is body height. As can be seen from the results, the average height in our work was 183.9 cm and weight 84.10 kg. In comparison, Croatian players' height was 190.79 cm and weight 91.29 kg (Srhoj, Marinovic, & Rogulj, 2002). From this, we understand Kosovo handball players to be about 17 cm smaller and about 6 kg leightner. The body height and body weight of Slovenian players are 188.44 cm and 89.56 kg (Sibila & Pori, 2009).

Table 2 shows that in morphological terms there are significant statistical differences according to game positions: winger players are shorter and lighter in weight compared to backcourt players, pivots and goalkeepers. While backcourt players have resulted better in morphological parameters than wingers, this difference is not very significant with pivots and goalkeepers.

The main goal in this paper was to assess the throwing speed of the ball in the goal, with and without bouncing, according to the positions of the game winger, back, pivot and goalkeeper. The overall average speed of standing shot was 85.67 km/h and 84.20 km/h speed of jump shot measured by the radar gun. The significance of the difference between the play positions were determined by ANOVA and Kruskall-Wallis. Post hoc test showed differences in the speed standing shooting between the play positions in significance of $p<0.05$ between the goalkeeper and wings. The differences gained have a logical flow because it is known that the role of the goalkeeper is not to shoot at the port. The same difference at the significance level ($p<0.05$) is between wing and backcourt; also this difference can be implied by considering the selection where the backcourt are players with more developed morphological parameters. Their positions during the game are more predisposed to shooting, while there is no difference between the pivot and the backcourt player. Almost the same results were obtained in the goal-scoring for which the difference between the goalkeeper and the winger is in favour of the latter; also the goalkeeper has differences with all players according to the positions of the game ($p<0.05$). Even backcourt players with wings have differences at the level of significance ($p<0.05$) while there are no statistically valid differences between back and pivot.

Almost the same results have been obtained by other authors (Shalfawi, Seiler, Tønnessen, & Haugen, 2014). We can conclude that players with larger morphological parameters may have greater predispositions for goal-scoring speed, which is also confirmed in the work of many authors. The good news is that many authors agree that with proper exercise and programming, the speed of shooting in the goal can be increased (Cherif, Chtourou, Souissi, Aouidet, & Chamari, 2016).

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Conflicts of interest
The authors declare no conflict of interest.

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References

Alves, A., & Marques, M. (2013). Throwing velocity predictors in elite team handball players. *Journal of human sport & exercise*, 12-13.

Cherif, M., Chtourou, H., Souissi, N., Aouidet, A., & Chamari, K. (2016). Maximal power training induced different improvement in throwing velocity and muscle strength according to playing in elite male handball players. *Biology of Sport*, *33*(4), 393–398.

Çitaku, F. (1999). *Stërvitja sportive në Hendboll.* Prishtinë: Universiteti i Prishtinës.

García, M., Alcaraz, P. E., Ferragut, C., Manchado, C., Abraldes, J. A., Rodríguez, N., & Vila, H. (2011). Body composition and throwing velocity in elite female handball players. *Cultura, Ciencia y Deporte*, *17*, 129-135.

Gorostiaga, E. M., Granados, C., Ibanez, J., & Izquierdo, M. (2005). Differences in physical fitness and throwing velocity among elite and amateur male handball players. *International Journal of Sports Medicine*, *26*, 225-232.

Havolli, J., Bahtiri, A., Begu, B., Ibrani, A., & Makolli, S. (2018). Monitoring of some strength parameters in handball. *Sport Mont, 16*(1), 37-39. doi: 10.26773/smj.180208

Hermassi, S., Chelly, S. M., Tabaka, Z., Shephard, R., & Chamari, K. (2011). Efeects of 8-week in-season upper and lower limb heavy resistance training on the peak power, throwing velocity, and sprint perfomance of elite male handball players . *Journal of Strength and Conditioning Research*, *25*(9), 2424–2433.

Joris, H., Edwards, V. M., Van Ingen Schenau, G. J., & Kemper, H. C. G. (1985). Force, velocity and energy flow during the overarm throw in female handball players. *J Biomech*, *18*(6), 409-414.

Manchado, C., García-Ruiz, J., Cortell-Tormo, J. M., & Tortosa-Martínez, J. (2017). Effect of Core Training on Male Handball Players' Throwing Velocity. *Journal of human kinetics*, *56*, 177–185. https://doi.org/10.1515/hukin-2017-0035

Marques, C. M., Tillaar, R., Vescovi, J., & Gonzalez-Badillo, J. (2007). Relationship Between Throwing Velocity, Muscle Power, and Bar Velocity During Bench Press in Elite Handball Players. *International Journal of Sports Physiology and Performance*, *2*, 414-422.

Rivilla-Garcia, J., Grande, I., Sampedro, J., & Van Den Tillaar, R. (2011). Influence of opposition on ball velocity in the handball jump throw. *Journal of Sports Science and Medicine*, *10*(3), 534–539.

Shalfawi, S.A.I., Seiler, S., Tønnessen, E. & Haugen, T.A. (2014). Aspects of shooting velocity in Norwegian Elite team Handball. *Serbian Journal of Sports Sciences*, 8, 33-40.

Sibila, M., & Pori P. (2009). Position-Related Differences in Selected Morphological Body Characteristics of Top-Level Handball Players. *Collegium antropologicum*, *4*, 1079–1086.

Srhoj, V., Marinovic, M., & Rogulj, N. (2002). Position Specific Morphological Characteristics of Top-Level Male Handball Players. *Collegium Antropologicum*, *1*, 219–227.

Werner, S. L., Fleisig, G. S., Dillman, C. J., & Andrews, J. R. (1993). Biomechanics of the elbow during baseball pitching. *The Journal of Orthopaedic and Sports Physical Therapy*, *17*(6), 274–278.